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GB 915424
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GB 470207
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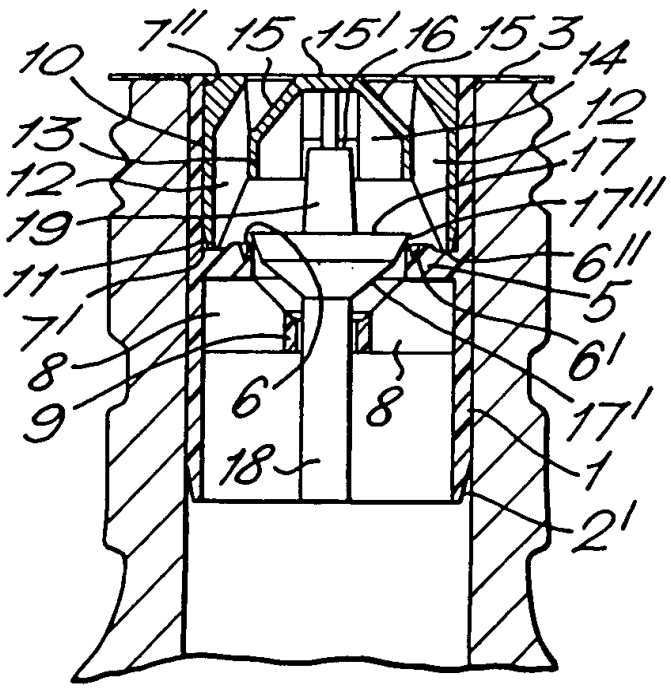
(54) Non-return valve unit for containers

(57) A non-return valve unit suitable for use with any type of bottle neck comprises a tubular slightly frusto-conical body (1) adapted to frictionally-fit substantially wholly within the bottle neck and having a brim (3) to prevent dripping, an integral transverse septum (5) defining an annular seat (6) for a check valve (16), and radial ribs (8) integral with the tubular body and the transverse septum (6) supporting an annular guide (9) for the depending stem (18) of the check valve. An upper chamber (7) within the body (1) houses a pouring device (10) of frusto-conical shape. The pouring and valve guard device (10) has guide ridges (14) for guiding the movement of an upper stem (19) of the check valve (16). The device thus comprises only three separately-formed components, namely the tubular body, the valve, and the pouring and valve guard device.

FIG.4.



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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

FIG.1.

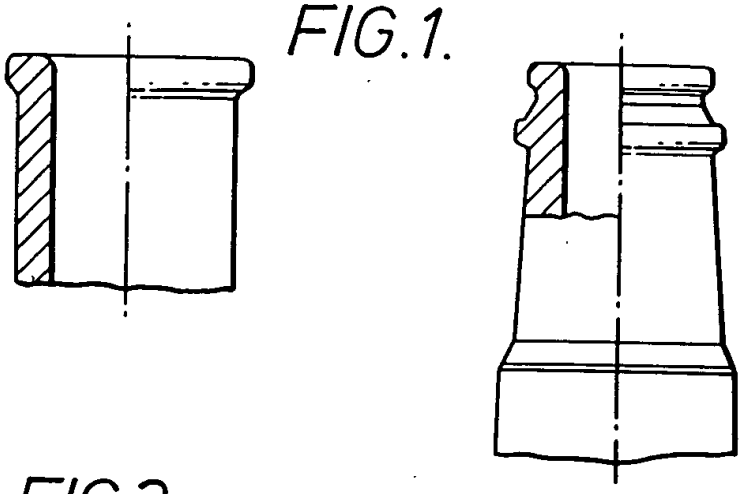


FIG.2.

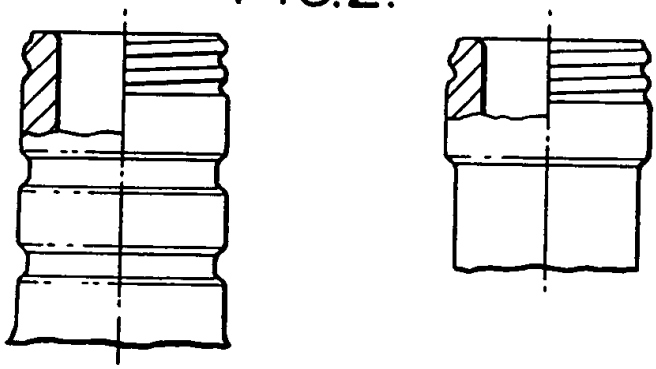


FIG.3.

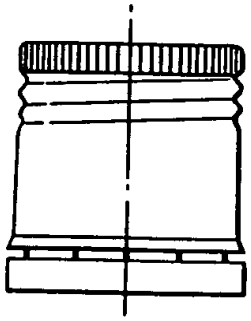
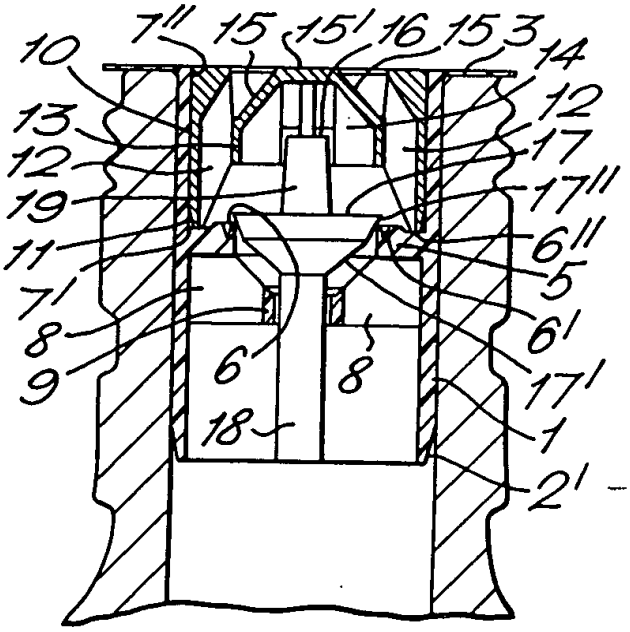


FIG.4.



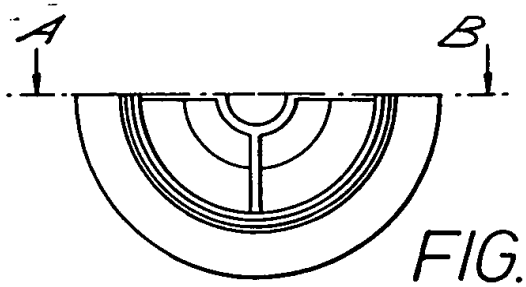


FIG.5.

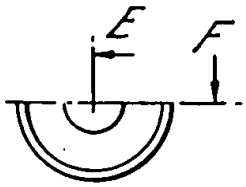


FIG.11.

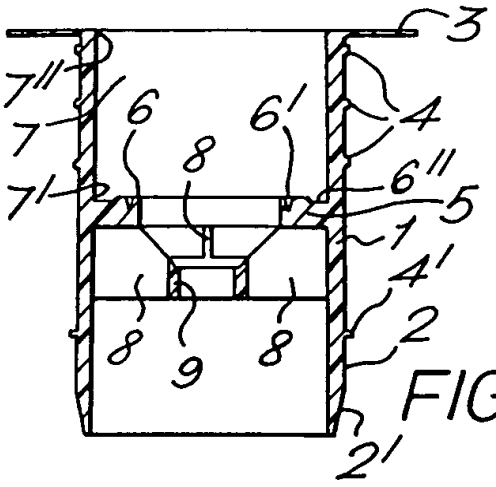


FIG.6.

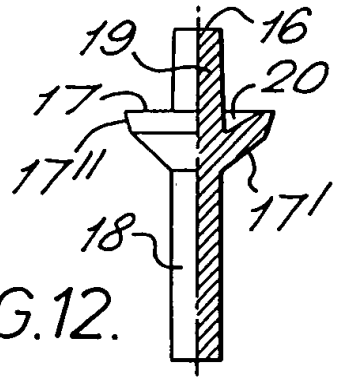


FIG.12.

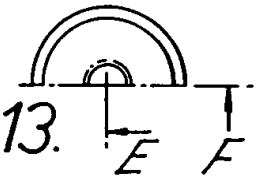


FIG.13.

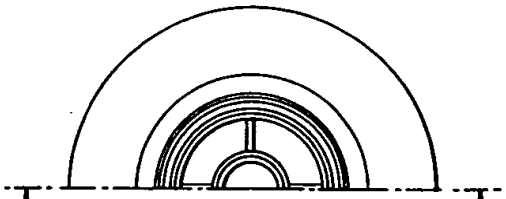


FIG.7.

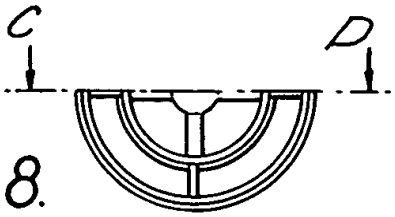


FIG.8.

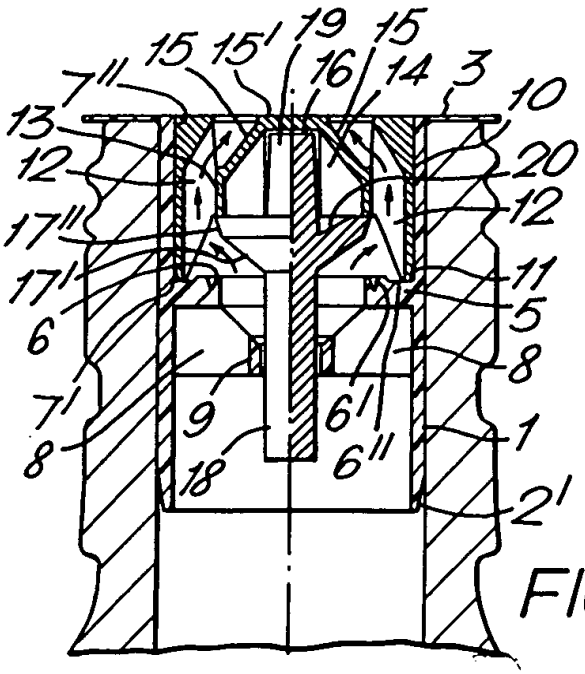


FIG.14.

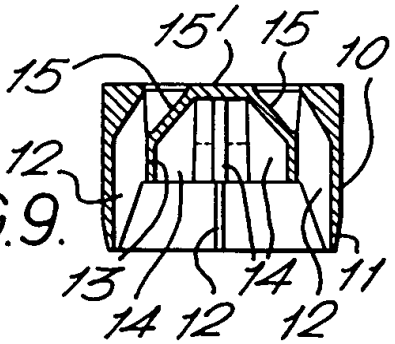


FIG.9.

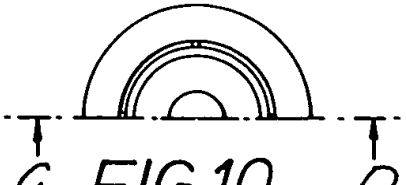


FIG.10.

SPECIFICATION

Non-return valve unit for containers

The present invention relates to a non-return valve unit for containers and particularly for bottles.

Non-return valves for bottles are used to ensure that the liquid contained in the bottles has not been adulterated. However, the valves known to date, have certain drawbacks given the various requirements which they must satisfy.

Such valves should, first of all, be perfectly inviolable, that is, not permit, under any circumstances, the introduction of any liquid into the bottle in which the valve is inserted. In addition, the valve should allow a reasonable and controlled discharge of liquid from the bottle, since generally such valves are used in bottles containing spirits or alcoholic beverages which are usually served in small individual measures. Therefore, the discharge given by the valve is important for the convenient and efficient use of the bottle in which it is used. In addition it is desirable to include a device which will prevent the running of liquid down the bottle since this can affect the repeated dispensing of the liquid contained in the bottle.

Another desirable property of the valve is that removal of the valve from the bottle must only be possible by irreversible destruction of the valve or its components, the fradulent removal of which is thus made evident to the consumer.

Finally, the valve must be of an economical manufacture, and must be easy to apply and insert into the top of the bottle.

Valves which simultaneously and efficiently satisfy all the aforementioned requirements are not known.

Despite the existence of some valves that are strictly inviolable, such valves are made up of a large number of components, the insertion system of the valve in the neck of the bottle contributing to that large number (usually never under five). This requires necks of special shapes as for example those represented by Fig. 1 of the accompanying drawings and implies the existence of an arresting belt of the valve in aluminium or plastics material. The machines to apply such a belt and to manufacture and assemble the valve are expensive, they require tuning and are of delicate functioning.

Therefore, generally to manufacture this type of known valve, the assembly of the valves is slow because they usually comprise five, six and sometimes even seven elements; it is expensive because it requires that the manufacturer has simultaneously at his disposal, for a good labour return results, a number of injector machines at least equal to the number of plastics material components which comprise the valve.

Finally, the outer irregular geometry of the known valves, and their size, impose difficulty in their packing which has to be made in bulk with a low number of pieces to a container.

According to the present invention there is provided a non-return valve unit for a container the valve unit being shaped and arranged such that once it has been inserted into the top of a container it is not readily removable therefrom, the valve unit comprising a pouring device arranged in a substantially tubular body which has an outer surface which is slightly frusto-conical in shape, and end of the said body being extended by a cylindrical wall followed by a frusto-conical wall, the outer diameter of the free end of the frusto-conical wall being smaller than the diameter of the inside of the top of the container into which the valve unit is to be inserted, the body having an internal, integral transverse septum forming a circular seat for a check valve, the seat being coaxial with the said body, and a number of radial septa which are integral with the transverse septum and with the wall of body, the said radial septa acting as supports for an annular guide into which a stem of the check valve is slidingly fitted.

An embodiment of the present invention will hereinafter be described, by way of example, with reference to the accompanying drawings, in which:–

Figure 1 shows a side view and a partial section of two types of bottle necks designed for use with known non-return valves,

Figure 2 shows a side view and partial section of two types of bottle necks designed for use with capsules or stoppers of the type generally known as "pilfer proof",

Figure 3 is an elevation of a stopper or capsule of the "pilfer proof" type,

Figure 4 is an elevation, shown partly in section, of an embodiment of a valve unit according to the present invention, assembled in the bottle neck of a bottle showing the check valve in the closed position,

Figure 5 is a partial view of the underside of the body of the valve unit of Fig. 4,

Figure 6 is a sectional view, taken along line AB of Fig. 5, of the body of the valve unit,

Figure 7 is a partial plan view of the body of the valve unit of Fig. 4,

Figure 8 is a partial plan view of the pourer of the valve unit of Fig. 4,

Figure 9 is a section taken along line CD of Fig. 8, of the pourer,

Figure 10 is a partial underside view of the pourer of the valve unit of Fig. 4,

Figure 11 is a partial plan view of the check valve of the valve unit of Fig. 4,

Figure 12 is an elevation, partly in section taken along line EF of Fig. 10, of the check valve,

Figure 13 is an underside partial view of the check valve of Fig. 10,

Figure 14 is a view identical to Fig. 4 but showing the check valve fully opened.

A non-return valve unit of the present invention can be applied to any type of bottle neck and, to a certain degree, is independent of the type of the bottle since it is fully inserted into the neck as if it were a stopper.

The embodiment described below is especially intended for use in bottles which use the classic "pilfer proof" top, that is, a threaded aluminium stopper, connected by way of links to an under skirt fastened around one or more grooves or corrugations provided in the bottle neck as seen in Fig. 3.

This type of bottle top is the one mostly used in bottling spirits and alcoholic beverages. These products, due to their nature and cost, are more susceptible to adulteration hence the very special interest in the direct application of the present invention to this type of bottle top, since previously known inviolable valves required special-type bottle necks, examples of which are given in Fig. 1. This implies the necessity of a special bottle top, consequently resulting in the need for specially manufactured bottles to agree with the chosen inviolable unit. Over and above all the inconveniences, by using any of the known inviolable valve units, the cost is greatly affected.

With the inviolable valve unit of the present invention, besides eliminating the disadvantages mentioned, it is possible to manufacture a valve unit at a much lower price per unit in comparison with known units.

As may be seen from the accompanying drawings the universal valve unit of the invention essentially consists of three main parts; the body 1 of the unit 1, shown individually in Figs. 5 to 7, the pouring device 10 represented in Figs. 8 to 10, and the retention valve 16 represented in Figs. 11 to 13.

The body 1 of the unit, which may be best seen in Fig. 6, has a slightly frusto-conical outer shape, so that once it is inserted into a bottle neck it acquires a conical form which prevents the subsequent removal of the entire unit. The lower extremity of the body 1 ends in a cylindrical wall 2 followed by a frusto-conical wall 2' intended to facilitate the insertion of the unit into a bottle neck, the outer diameter of the lowest part of the body 1 being smaller than the nominal diameter of the neck of the bottle.

In its upper part, the body 1 has a periheral brim 3 which lies in a plane extending normally to the axis of the body 1, the brim being provided to avoid the formation of drops of the liquid. As is known, the formation of drops is caused by the adherence of liquid to the outer walls of the bottle neck. By means of the brim 3 it is possible to cut through the level of the liquid when the bottle is tilted vertically to discharge the liquid contained therein.

The body thus placed, makes it possible to entirely eliminate the formation of the drops thus greatly facilitating the use of the liquid contained in the bottle.

The brim 3, being an integral part of the body 1 which is suitably made of low density polyethylene, has a high degree of elasticity, and further contributes to a good sealing of the bottle top or capsule.

The outer surface of the body 1 has several peripheral ridges 4,4' which are intended to cause adherence to the inner smooth surface of the bottle top and contribute to the fastening of the valve unit. It should be noted that although the number of peripheral ridges may be arbitrary their distribution should be such that there are no ridges in the immediate vicinity of the level of a septum 5 on the inside of the body 1. This is because once the adjustment of the non-return valve unit to the inner surface of the bottle top by means of pressure is effected, the existence of any ridges in this area would cause alterations in the check valve seat 6 due to its elasticity, and this would affect the sealing characteristics of the check valve. As shown in the attached drawings and particularly Figs. 4 and 6, three ridges 4 are distributed in the upper part of the body 1, and act to increase friction with the inner surface of the bottle top, and there is a single ridge 4' in the lower part of the body 1 which not only increases friction but also causes sealing and avoids the flow of liquid between the inner surface of the bottle top and outer surface of the body 1.

The seat 6 of the check valve 16 is placed approximately half way between the upper and lower brims of the body 1 and is integral with the lateral surface of the body 1. The seat consists of an opening, preferably circular, formed by a septum 5 extending substantially perpendicularly to the wall of body 1. As shown more clearly in Fig. 4, the seat 6 of the check valve 16 is formed by an edge derived from a circular cleft 6', the cleft being concentric with the circular opening. The cleft 6' affords elasticity to edge 6 and enables deformation to occur thereby allowing a perfect sealing of the check valve 16, for example if an attempt is made to add adulterated liquid into the bottle.

The thickness of the septum 5 decreases in the direction towards the wall of body 1, as a result of the existence of a depression 6'' bordered on the side of the seat 6 by a surface with a 45° inclination. The inclined surface acts to deflect the lines of flow of a liquid which are introduced through the opening of pourer 10, thereby to deflect them from the walls 17' of the check valve 16, avoiding displacement of the check valve from the seat. The septum 5 forms the base of a chamber 7 which houses the pourer 10 which

is located by means of insertion and encasing. The pourer is illustrated more clearly in Figs. 8 to 10. The inner surface of chamber 7 is slightly frusto-conical to avoid removal of the pourer after the valve unit has been inserted in the neck of a bottle. The pourer 10 is held even more tightly as a result of contraction of the valve unit when it has been introduced in a bottles neck. The inner diameter 7' at the base of the chamber 7 is accordingly slightly greater than the diameter 7'' of the chamber 7 the mouth of the bottle (Fig. 5).

An annular guide 9 for the lower stem 18 of the check valve 16 is integrally attached to the lower surface of the septum 5 and to the side wall 2 of body 1 by four septa 8 which are radially disposed. The guide 9 is coaxial with the longitudinal axis of body 1 and the lower stem 18 of the check valve 16 is slidably fitted in the annular guide, as shown in Fig. 4.

The body 1 with all its aforementioned components is intended to be sold as one single item made of a material which is sufficiently elastic to give the desired properties. The body is preferably made of low density polyethylene, for example by injection moulding methods.

The pourer 10, as shown in Figs. 8 to 10, and also in the assembly shown in Fig. 4, serves as a guide for the upper stem 19 of the check valve 16 and also provides a uniform flow without turbulence of the liquid contained in the bottle. The rate of flow is such that the individual dose of the alcoholic beverage usually served may be poured within a reasonable space of time. The pourer 10 also serves as an upper stop for the check valve 16 when the latter moves from the seat 6, 6' when the bottle is tilted and the liquid contained in the bottle exerts pressure on the check valve.

The outer shape of the pourer 10 is frusto-conical and tapers towards the upper end of the pourer. A lower portion 11 of the pourer is also frusto-conical but tapers in an opposite sense towards the bottom of the pourer in order to facilitate the introduction and encasing of the pourer in chamber 7 of the body 1. There are four ridges or septa 12 radially arranged within the pourer; these reinforce the pourer and support a concentric cylindrical wall 13 having an outer diameter which is the same as that of the plate 17 of the check valve 16. Extending radially inwardly from the wall 13 to an adequate distance from the longitudinal axis of the pourer are four guide ridges 14 for guiding the movement of the upper stem 19 of the check valve.

The cylindrical wall extends upwardly to then form an inverted bowl-shaped portion by means of a frusto-conical surface 15, which forms a surface for deflecting the flow of liquid ending in a flat surface 15' at the same level as the upper edge of the pourer.

In this manner the cylindrical wall 13, the frusto-conical surface 15 and the upper part 15' form a chamber which houses the guide ridges 14 and which fully accommodates the upper stem 19 of the check valve 16 when the check valve is displaced by pressure of the liquid on tilting the bottle, causing the upper surface of the plate 17 of the check valve 16 to abut against the lower edge of the cylindrical wall 13, as shown in Fig. 14.

It will therefore be seen that when the check valve is fully raised, as seen in Fig. 14, that is, fully opened, the geometric form of the lower surface of the plate of the check valve 16, is complementary with the cylindrical wall 13 and the frusto-conical surface 15 of the pourer, thus creating a flow path, indicated by the arrows in Fig. 14, which has no obstructions thereby allowing liquid to flow out of the bottle without turbulence.

It should be noted that owing to the specific geometry of the valve, a narrowing of the flow path occurs in passing from the cylindrical wall 13 to the frusto-conical zone 15. This causes a higher speed when pouring the liquid, thus causing a squirt directed forwardly of the bottle, avoiding the formation of accretions around the bottle. This feature of the invention is very important, so that a reasonable flow of liquid may be poured from the bottle in a practical and easy manner.

The check valve 16 shown in Figs. 11 to 13 consists of a circular plate 17, shaped as shown in the drawings, having a double frusto-conical profile (i.e. with generatrices of different slope). The maximum diameter of the plate, i.e. the diameter of the upper edge of the plate is the same as the outer diameter of the cylindrical wall 13 of the pourer, so that a perfect engagement between the plate 17 and the wall 13 may be obtained when the valve raises fully when the bottle is tilted in order to extract liquid therefrom (see Fig. 14). The generatrix 17' of the first frusto-conical zone of the plate 17 is of such a slope that the distance from this generatrix to the edge of the seat 6 in body 1 and that between the outer surface of the cylindrical wall 13 of the pourer and the inner surface of the wall 10 of the pourer is the same when the check valve is fully raised. This avoids strangulation or tubulence during withdrawal of liquid from the bottle.

The slope of the frusto-conical upper zone 17'' is such as to give a perfect seal on the edge of the seat 6 of the body. The check valve 16 has a lower cylindrical guide stem 18 which is slidably engaged in annular guide 9. The stem 18 is long enough to lower the center of gravity of the check valve, so that the latter may have a maximum tendency to lower itself once the inclination of the bottle is reduced after withdrawal of the liquid. This feature of the invention is very important in order to render practically impossible the in-

troduction of any liquid into the bottle.

For the same purpose, the stem of the upper guide 19 of the valve, which is guided by the edges of guides 14 of the pourer, is frusto-conical, and tapers upwardly, its length being determined exactly by the required displacement of the valve as may be seen in Fig. 14. With such an arrangement the desired guided movement of the valve, which is essential for the good functioning of the unit, is obtained.

The plate of the check valve also has an inner frusto-conical zone 20 so as to form a basin, the object of which is to lessen the weight of the valve, to assist in lowering the center of gravity of the valve for the reason already mentioned, and moreover to increase the surface subject to the pressure of a liquid which may be fraudulently intended to be introduced into the bottle, which offers an added barrier.

Both the pourer and the check valve must be, according to this invention, made of a rigid plastics material capable of withstanding deformations of the body 1 on being introduced into the neck of the bottle. Polystyrene is an appropriate material for this effect although other materials of adequate characteristics may be used if they permit the manufacture of the parts by injection moulding.

It will be seen that the valve unit described above has the following characteristics:

(a) Effectively inviolable, that is, practically does not permit the introduction of any liquid into the bottle on which it is used and may not be removed unless the valve is destroyed.

(b) Of easy and economical manufacture and composed of only three elements.

(c) Does not require a special type of bottle neck; can be applied to any shape of neck, since the valve is fully inserted into the bottle neck.

(d) Its size and outer geometrical form permit easy and economical packing. The outer shape of the valve is practically cylindrical, which provides an ideal form for packing, due to its outer dimensions, much smaller of those known valves, since after its full insertion it is incorporated in the bottle neck.

(e) Finally, the system of inviolability does not interfere with the existence of a minimum discharge flow of the liquid contained in the bottle, that is, the system, besides being efficient permits a discharge that will not cause an excessively slow service in handling normal measures of the beverage.

CLAIMS

1. A non-return valve unit for a container, the valve unit being shaped and arranged such that once it has been inserted into the top of a container it is not readily removable therefrom, the valve unit comprising a pouring device arranged in a substantially tubular body which has an outer surface which is slightly frusto-conical in shape, one end of the said body being extended by a cylindical wall followed by a frusto-conical wall, the outer diameter of the free end of the frusto-conical wall being smaller than the diameter of the inside of the top of the container into which the valve unit is to be inserted, the body having an internal, integral transverse septum forming a circular seat for a check valve, the seat being coaxial with the said body, and a number of radial septa which are integral with the transverse septum and with the wall of body, the said radial septa acting as supports for an annular guide into which a stem of the check valve is slidingly fitted.

2. A valve unit as claimed in Claim 1, wherein the transverse septum is located halfway up the length of the body and forms together with the mouth of the body an upper chamber where the pouring device is housed and encased, the inner surface of the side walls of said body in the region of said chamber being slightly inclined so that the inner diameter of the body next to the transverse septum is slightly greater than the diameter at the mouth of the body.

3. A valve unit as claimed in Claim 2, wherein spaced peripheral ridges are located on the outer surface of the body alongside the upper chamber, the lowest ridge of the group extending upwardly and being at a distance above the level of the transverse septum, and wherein a peripheral ridge is located on the outer surface of the lower part of the said body, spaced at a distance below the level of the transverse septum.

4. A valve unit as claimed in any of Claims 1 to 3, wherein the seat for the check valve is elastically deformable as a result of the presence of a circular cleft in the transverse septum, the cleft being concentric with the circular seat, and wherein the thickness of the said transverse septum decreases in the direction towards the side wall of the body by means of a depression between the cleft and the side wall of the body, the depression being bounded by a side wall inclined at approximately 45°.

5. A valve unit as claimed in any preceding claim, wherein the body is formed as an integral unit, made of low density polyethylene and manufactured by an injection molding method.

6. A valve unit as claimed in any of the preceding claims, wherein the pouring device is housed and encased in a chamber defined within said body, the pouring device having an outer cylindrical shape ending at its lower edge in a frusto-conical zone, the smallest diameter of which is smaller than the normal diameter of the mouth of said body, the pouring device having in its interior ridges or septa extending radially and supporting a coaxial cylindrical wall, the outer diameter of which is identical to the outer diameter of a

plate of the check valve, the septa also forming guides for an upper stem of the said check valve, and wherein the cylindrical wall extends upwardly to form a inverted bowl by means of a slanted deflecting wall connecting the cylindrical wall with an upper circular plane thus forming, together with a coaxial inner side cylindrical wall of the pourer and with an upper slanted part a circular passage for the drainage without turbulence of liquid from the bottle.

7. A valve unit as claimed in claim 6, wherein the pouring device has a reducing section in the zone of the top of the cylindrical wall and the deflecting wall due to the narrowing caused by the inclination of the inner wall of the pourer in the upper part.

8. A valve unit as claimed in Claim 6 or 7, wherein the distance between the lower edge of the coaxial cylindrical wall and the internal wall of said circular surface is approximately equal to the length of the upper stem of the guide of the said check valve, so that the later, on raising will cause a plate of the check valve to abut against the lower edge of the cylindrical wall, the outer surface of said plate together with a cylindrical wall against which it abuts together with the inner surface of the pourer forming an annular passage for liquid.

9. A valve unit as claimed in any of the preceding claims, wherein the pouring device is formed as a single part, is made of polystyrene and is made by an injection molding method.

10. A valve unit as claimed in any of the preceding claims, wherein the check valve comprises a circular plate of a frusto-conical profile with generatrices of different slopes, the diameter of the upper edge of the plate being identical to the outer diameter of an inner cylindrical wall of the pourer device, the slope of the generatrix of the lower frusto-conical surface being such that the distance from this generatrix to the seat in the body, when the valve is totally raised, is the same as the distance of the cylindrical wall of the said pourer to the inner surface of the wall of the said pourer, the upper frusto-conical surface having an adequate slanting so that the valve will sit perfectly in the seat of the body.

11. A valve unit as claimed in any of the preceding claims, wherein the check valve has a lower cylindrical stem of such a length as to cause a lowering of the centre of gravity of the check valve and a shorter upper stem slightly frusto-conical to aid the lowering of the centre of gravity of the valve.

12. A valve unit as claimed in any of the preceding claims, wherein said check valve has a circular plate which is hollowed internally to form a basinlike hollow in order to reduce the weight of the valve thereby contributing to the lowering of the centre of gravity of the valve and augmenting the surface subjected to the pressure of liquid fraudulently introduced in the unit.

13. A valve unit as claimed in any of the preceding claims, wherein the check valve is formed as a single part, is made of polystyrene and is made by an injection molding method.

14. A valve unit as claimed in any of the preceding claims, arranged to be housed and held within a "pilfer-proof" type bottle top by means of a peripheral planar brim integral with the upper part of the body, so that the assembly of the valve unit in the bottle neck can be made simultaneously with the placing of the said bottle top on the bottle neck.

15. A valve unit as claimed in any of the preceding claims, wherein said body possesses a cylindrical zone in order to obtain a stable equilibrium when the unit is introduced in the bottle neck by means of automatic stoppering.

16. A non-return valve unit for a container substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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